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THE SPECIES OF *CALINEURIA* AND *DORONEURIA* (PLECOPTERA: PERLIDAE)¹

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ABSTRACT.— The genus *Doroneuria* is reviewed, and characters necessary for recognition of its two included species are figured. *Doroneuria baumanni*, sp. nov., is described for the male, female, and nymph, and a male holotype and female allotype are designated. *Calineuria* is removed from the synonymy of *Doroneuria*, and the genus is characterized in detail. Distributional data are presented for species in both genera.

Doroneuria was proposed as a subgenus of *Acroneuria* by Needham and Claassen (1922) with the newly described *theodora* as the type species. This subgenus was omitted from the systematic list in the Needham and Claassen monograph (1925). Ricker (1954), apparently unaware of the former paper, proposed a new subgenus, *Calineuria*, for the species *Acroneuria californica* (Banks) and *A. theodora* Needham and Claassen with *californica* (Banks) as type species. Illies (1966) gave *Doroneuria* generic status and considered *Calineuria* a synonym.

A detailed study of these species has indicated clearly that two genera are involved and has led to the discovery of a new species of *Doroneuria*.

Calineuria Ricker

Acroneuria (*Calineuria*) Ricker (1954:39). Type species *Perla californica* Banks.

Doroneuria: Illies (1966:330). In part.

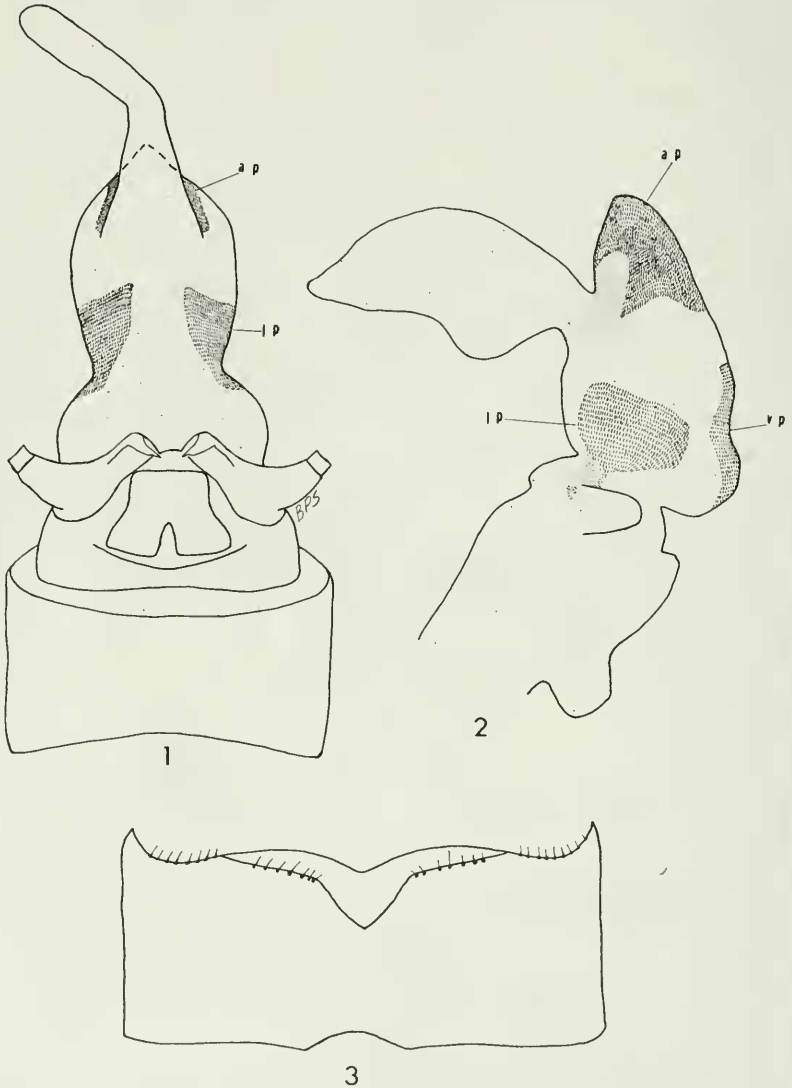
Doroneuria: Zwick (1973:274). In part.

The genus *Calineuria* may be characterized in the adult male by (1) a longitudinally rectangular hammer on abdominal sternum 9, (2) a median, heavily sclerotized tergite on tergum 10 (Fig. 1), and (3) the aedeagus (Figs. 1, 2) bearing on the basal portion 4 prominent patches of long golden-brown spinules (2 lateral, 1 ventral, and 1 apical). Adult females are characterized by (1) the unproduced, shallowly notched posterior margin of sternum 8 with an unsclerotized, U-shaped border around the notch (Fig. 3) and (2) a membranous vagina that extends forward to near the anterior margin of sternum 7 and is not lined internally by spinulae.

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Mature nymphs are characterized by (1) an incomplete, irregularly spaced row of spines across the occiput, (2) numerous prominent spines on each abdominal tergum in addition to the posterior fringe, (3) a dense fringe of long silky hairs along the mesal surface of the cerci originating in the whorl of spines on each cercal segment (Fig. 14), and (4) usually a complete posterior fringe of spines across



Figs. 1-3. *Calineuria californica*: 1, Male terminalia with aedeagus extruded, dorsal; 2, Aedeagus, lateral; 3, Female abdominal sternum 8. (ap=apical patch, lp=lateral patch, vp=ventral patch).

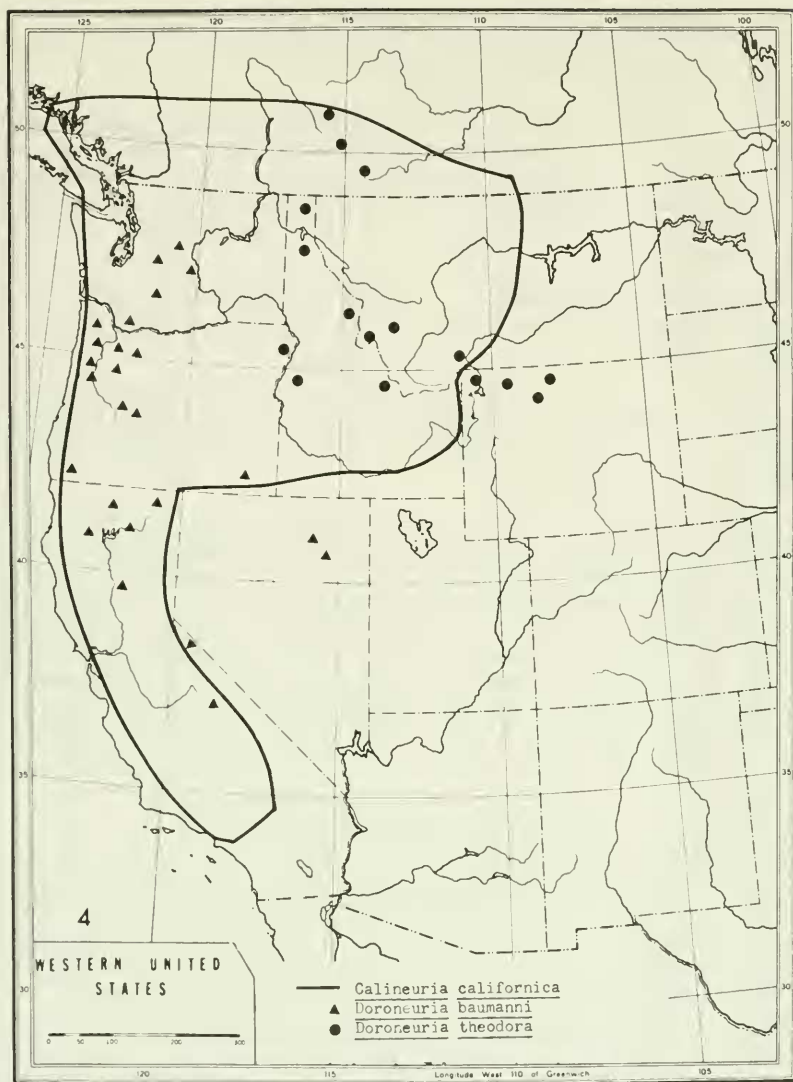


Fig. 4. Distribution map of *C. californica*, *D. baumanni*, and *D. theodora*.

abdominal sternum 7 (Fig. 14). This monotypic genus is known only from western North America.

Calineuria californica (Banks)

Perla californica Banks (1905:87). Holotype ♀; Claremont, California. (MCZ #11318).

Perla concolor Banks (1908:255). Syn. Needham and Claassen, 1922.

Acroneuria californica: Needham and Claassen (1925:192).

Acroneuria (Calineuria) californica: Ricker (1954:39).

Doroneuria californica: Illies (1966:330).

MALE.— Macropterous. Length of forewings 19-21 mm; length of body 18-20 mm. General color yellow brown. Wings hyaline, veins brown. Paraprocts sclerotized, fingerlike, with a small terminal acute spine. Aedeagus (Figs. 1, 2) as described above. Occasional specimens with ventral patch of aedeagal spinules variously reduced in size.

FEMALE.— Macropterous. Length of forewings 24-27 mm; length of body 22-23 mm. Subgenital plate (Fig. 3) and vagina as described above.

NYMPH.— Length of mature male 17-18 mm; mature female 22-23 mm. General color yellow and brown. Head with distinctive large yellow spot covering ocellar area. Abdominal sterna and cerci (Fig. 14) as described above.

Calineuria californica is a species of the Pacific coast and northern Rocky Mountains (Fig. 4). Previous studies (Gaufin et al., 1966; Baumann, 1973; Stark et al., 1973) have recorded the species from Colorado and Utah, but an examination of all this material in the University of Utah collection previously determined as *californica* has shown these records are of a presently undetermined species of *Acroneuria* (possibly *depressa* Needham and Claassen).

Specimens examined in this study: CALIFORNIA: *Alameda Co.*, Oakland, 15-V-10, E. C. Van Dyke, 1 ♀ (CAS); Oakland, 9-V-09, E. C. Van Dyke, 1 ♂ (CAS). *Alpine Co.*, Markleeville, 7-VII-49, Allen, 1 ♀ (CAS). *Butte Co.*, Big Chico Creek, 18-XI-71, M. Kainu, nymphs (UU). *Eldorado Co.*, 3 mi S Camino, 26-VI-48, MacNeill, 1 ♂ (CAS). *Humboldt Co.*, Prairie Creek, 9-VI-36, E. C. Van Dyke, 1 ♂ 1 ♀ (CAS); North Fk. Yager Creek, 8-VIII-66, R. E. Leech, 1 ♀ (CAS). *Lake Co.*, Anderson Springs, 20-III-55, Leuschner, 1 ♂ (INHS); 6 mi S Middletown, 12-V-26, 4 ♂ 5 ♀ (CAS). *Los Angeles Co.*, Arroyo Seco Canyon, 23-VI-18, E. C. Van Dyke, 1 ♀ (CAS); East Fk. San Gabriel River, 16-VI-59, nymphs (UU). *Marin Co.*, Muir Woods, 25-IV-64, D. G. Denning, 1 ♂ (ROM); Cascade Creek, 13-V-52, R. E. Leech, 1 ♂ (CAS); Bear Valley, 25-V-19, 1 ♂ (CAS); Ross, 25-IV-18, Van Duzee, 1 ♀ (CAS); Lagunitas, 14-IV-08, Van Duzee, 1 ♀ (CAS); Lagunitas, 30-V-38, Nast, 4 ♀ (CAS). *Mendocino Co.*, Camptche, 7-IV-36, E. C. Van Dyke, 1 ♂ (CAS); Yorkville, 30-IV-24, Van Duzee, 1 ♂ (CAS). *Mono Co.*, Convict Creek, VI-63, 1 ♂ (UU); Sonora Bridge, 28-VII-62, Rentz and MacNeil, 1 ♂ (CAS). *Placer Co.*, Truckee River, 1-VIII-68, R. W. Baumann, 6 ♂ 2 ♀ (USNM). *Plumas Co.*, Mohawk, 12-VII-57, Rentz, 1 ♂ (CAS); Quincy, 26-VI-73, D. R. Givens and S. D. Smith, 1 ♂ (CWSC). *San Bernardino Co.*, Lytle Creek, 7-VI-28, E. C. Van Dyke, 7 ♂ 4 ♀ (CAS). *Santa Clara Co.*, San Jose, 13-X-81, Van Duzee, 1 ♀ (CAS); Alum Rock Park, 29-VI-55, Ribble, 1 ♂ (KAN); 29-VI-69, Cobb, 1 ♂ (USNM). *Shasta Co.*, 26-VI-21, J. A. Kuscho, 1 ♀ (CAS); Burney Falls, 29-VI-47, H. P. Chandler, 1 ♀ (CAS); Castle Crags St. Pk., 20-VI-64, D. G. Denning, 1 ♂ (ROM). *Siskiyou Co.*, Sacramento River, 8-VII-53, H. P. Chandler, 3 ♂ (CAS). *Sonoma Co.*, Guerneville, 31-V-36, E. C. Van Dyke, 1 ♂ (CAS); 19-VI-10, J. Kuscho, 1 ♂ 1 ♀ (CAS). *Trinity Co.*, Trinity Center, 6-VI-64, J. Pinto, 2 ♂ 4 ♀ (UCR); Coffee Creek, 7-VI-34, E. C. Van Dyke, 1 ♂ 1 ♀ (CAS); Butter Creek, 21-VII-68, R. E. Leech, 1 ♀ (CAS). *Tuolumne Co.*, Dana Fk. Tuolumne River, 15-VII-36, Rayner 1 ♂ (INHS). IDAHO: *Boise Co.*, Boise River, 12-VI-31, Ivie, nymphs (UU). *Boundary Co.*, Moyie River, 26-III-65, A. V. Nebecker, nymphs (UU). *Kootenai Co.*, Hayden Creek, 7-VI-69, R. W. Baumann, 2 ♂

2♀ (USNM). *Lemhi Co.*, Salmon River, 28-VI-73, M. and E. Cather, 2♂ 2♀ (UU); Salmon River, 6-VII-64, A. R. Gaufin, 1♂ (UU); Salmon River, 11-VII-67, G. F. Edmunds, 1♂ 4♀ (USNM). *Shoshone Co.*, Coeur d'Alene River, 11-VI-69, A. R. Gaufin, 2♂ 2♀ (USNM). MONTANA: *Camas Co.*, Glacier Park, 7-VII-67, A. R. Gaufin, 1♂ (UU). *Flathead Co.*, Swan River, 29-VI-65, A. V. Nebeker and R. K. Allen, 41♂ 13♀ (UU) (USNM); Swan River, 1-VII-67, P. Milam, 6♂ 4♀ (UU); McGregor Creek, 1-VII-67, A. R. Gaufin, 1♂ 3♀ (UU); Camas Creek, 7-VII-67, A. R. Gaufin, 1♂ 1♀ (UU). *Lake Co.*, Swan River, 23-VI-67, P. Milam, 11♂ 6♀ (UU); Swan River, 10-VI-67, A. R. Gaufin, 9♂ 2♀ (UU). *Lincoln Co.*, Yaak River, 21-VI-69, R. W. Baumann, 7♂ (UU). *Missoula Co.*, Blackfoot River, 28-VI-67, A. R. Gaufin, 10♂ 7♀ (UU). *Pondera Co.*, Dupuyer, 24-VI-65, A. V. Nebeker, 1♂ (UU). *Ravalli Co.*, Bitterroot River, 28-VII-65, J. R. Grierson, 2♂ (UU). OREGON: *Benton Co.*, Corvallis, 22-V-34, R. E. Dimick, 1♂ (CAS); Corvallis, 8-V-34, Bali, 1♂ (INHS); Alsea, 27-V-34, J. Schuh, 2♂ 7♀ (CAS) (INHS). *Clatsop Co.*, Cannon Beach, 15-VI-27, E. C. Van Dyke, 1♂ (CAS); Big Creek, 28-V-49, S. G. Jewett, Jr., 5♂ 3♀ (CAS); Nehalem River, 11-VII-64, S. G. Jewett, Jr., 5♂ 1♀ (SGJ). *Columbia Co.*, Clatskanie, 19-V-36, J. Schuh, 1♂ (CAS); Scappoose, 20-VI-36, Rieder, 3♂ 3♀ (INHS). *Jackson Co.*, Rogue River, 17-VI-49, S. G. Jewett, Jr., 1♂ (CAS). *Lake Co.*, Paisley, 28-VI-51, B. Malkin, 2♂ 1♀ (CAS) (FMNH). *Lane Co.*, Bob Creek, 13-VIII-32, R. E. Dimick, 1♂ (CAS). *Lincoln Co.*, Siletz River, 24-V-34, R. E. Dimick, 3♂ (CAS). *Linn Co.*, Santiam, 26-VII-60, D. G. Denning, 1♀ (USNM). *Marion Co.*, Breitenbush, 11-VII-68, E. Evans, 1♂ (USNM). *Multnomah Co.*, Eagle Creek, 19-V-40, S. G. Jewett, Jr., 1♂ (CAS). *Washington Co.*, Gales Creek, 14-V-47, S. G. Jewett, Jr., 1♂ (CAS). WASHINGTON: *Clallam Co.*, Crescent Lake, 21-VI-40, S. G. Jewett, Jr., 1♂ (CAS); Forks, 2-VII-20, Van Duzee, 1♂ (CAS); Bogachiel River, 18-VI-67, R. W. Baumann, 2♂ 4♀ (USNM); Soleduck River, 23-VII-60, D. G. Denning, 1♀ (USNM). *Gray's Harbor Co.*, East Fk. Humptulips River, 2-IX-58, nymphs (UU); Donkey Creek, 18-VI-67, R. W. Baumann, nymphs (USNM). *Jefferson Co.*, Hoh River, 3-IX-58, nymphs (UU). *King Co.*, Rex River, 20-VII-72, C. Baker, 1♂ (UU); Rex River, 5-X-73, A. R. Gaufin, nymphs (UU). *Kittitas Co.*, Liberty, 27-VII-49, White, 1♀ (KAN). *Spokane Co.*, Little Spokane River, 13-VI-55, nymphs (UU). *Thurston Co.*, Deschutes River, 15-VI-67, R. W. Baumann, 10♂ 5♀ (USNM). *Yakima Co.*, Toppenish, 9-VII-35, Beamer, 2♀ (KAN); Naches River, 5-IX-58, nymphs (UU).

Doroneuria Needham and Claassen

Acroneuria (*Doroneuria*) Needham and Claassen (1922:249). Type species

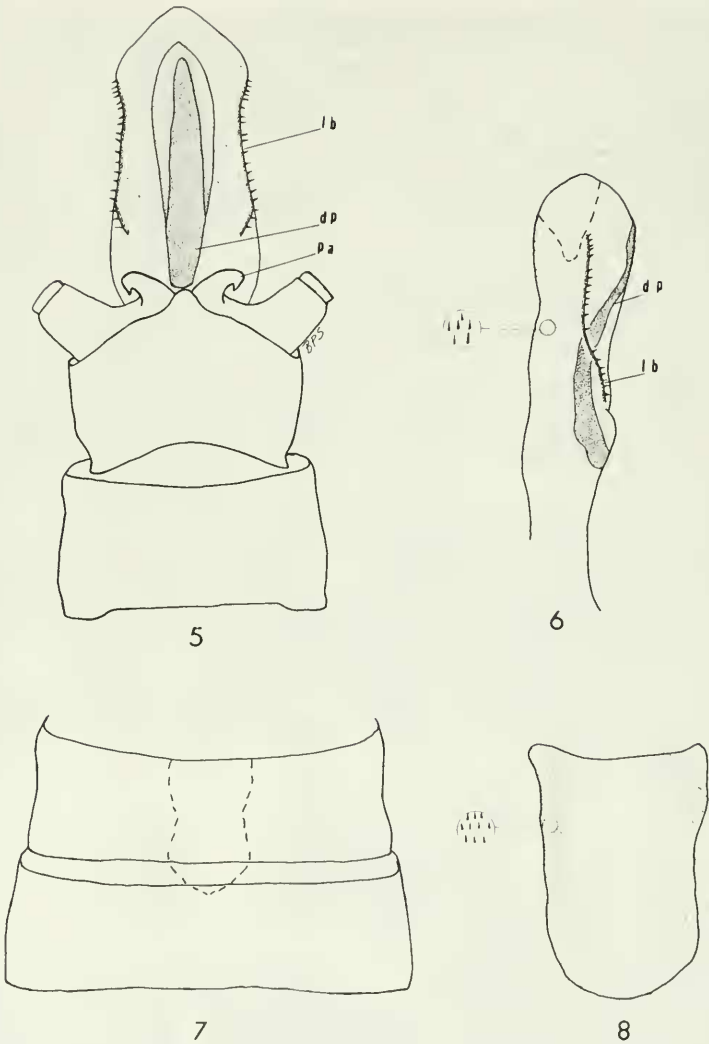
Acroneuria theodora Needham and Claassen by original designation.

Acroneuria (*Calineuria*) Ricker (1954:39). In part.

Doroneuria: Illies (1966:330). In part.

Doroneuria: Zwick (1973:274). In part.

The genus *Doroneuria* may be characterized in the adult male by (1) a longitudinally rectangular hammer on abdominal sternum 9 (Fig. 11), (2) tergum 10 without a median tergite, and (3) the aedeagus bearing a spatulate sclerotized plate dorsally and two elongate, narrow, sclerotized lateral bars (Figs. 5, 6). Adult females are characterized by (1) the almost straight (sometimes slightly produced mesally) posterior margin of sternum 8 (Fig. 7) and (2) a membranous vagina that extends forward to the posterior margin of sternum 7 and is lined with numerous small golden brown spinulae (Figs. 7, 8). Mature nymphs are characterized by (1) an incomplete, irregularly spaced row of spines across the occiput (Fig. 12), (2) numerous prominent spines on each abdominal tergum in addition to the posterior fringe, (3) a dense fringe of long silky hairs along the mesal surface of the cerci (Fig. 13), and (4) an



Figs. 5-8. *Doroneuria baumanni*: 5, Male terminalia with aedeagus extruded, dorsal; 6, Aedeagus, lateral; 7, Female abdominal sterna 7 and 8, vagina shown in outline; 8, Vagina. (pa=paraproct, dp=dorsal plate, lb=lateral bar).

incomplete posterior fringe of spines on abdominal sternum 7 (Fig. 13). The genus is presently known only from western North America.

Doroneuria baumanni, sp. nov.

Acroneuria theodora: Frison (1942:284-285). In part.

Acroneuria (Calineuria) theodora: Jewett (1959:89). In part.

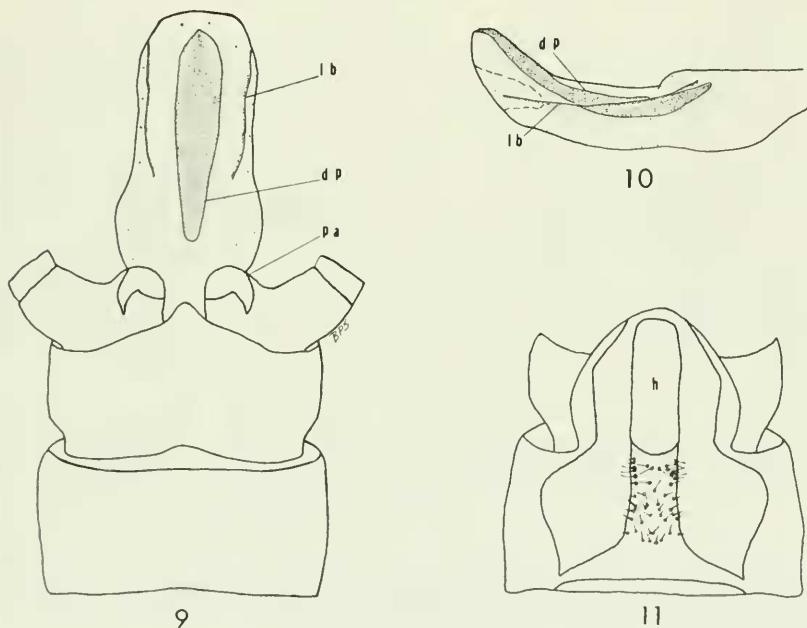
Doroneuria theodora: Illies (1966:331). In part.

MALE.— Brachypterous to macropterous. Length of forewings 18-27 mm; length of body 22-25 mm. General color dark brown. Wings hyaline, veins black. Paraprocts similar to *D. theodora*, sclerotized and fingerlike. Aedeagus (Figs. 5, 6) with 12-22 prominent spines on the lateral sclerotized bars; ventral and lateral surfaces of aedeagus with numerous minute spinulae.

FEMALE.— Macropterous. Length of forewings 31-33 mm; length of body 27-30 mm. Subgenital plate (Fig. 7) unproduced. Vagina (Figs. 7, 8) lined with minute golden brown spinulae.

NYMPH.— Length of mature male 20-22 mm; mature female 31-34 mm. Similar to *D. theodora* in coloration and general morphology. Occiput with a transverse row of long silky hairs between the postfrontal suture and the row of spines. Frons with a single long seta near each antennal base. Dorsum of thorax and abdomen with a median longitudinal row of long silky hairs.

Doroneuria baumanni is a species of the Cascade and Sierra Nevada Mountains of western North America (Fig. 4) with relict populations in Nevada and southeastern Oregon. The lack of records for *Doroneuria* in Ricker's (1943) study of southwestern British Columbia indicates that the species survived the Pleistocene glacia-



Figs. 9-11. *Doroneuria theodora*: 9, Male terminalia with aedeagus extruded, dorsal; 10, Aedeagus, lateral; 11, Male abdominal sterna 9 and 10. (h=hammer, pa=paraproct, dp=dorsal plate, lb=lateral bar)

tions in a coastal refuge and has been unable to recolonize severely glaciated areas.

Types.— Male holotype, female allotype, and 5 male and 1 female paratypes from Burney Falls State Park, Shasta Co., California, 8-X-72, D. G. Denning. Holotype male No. 73022 and allotype female deposited at the United States National Museum, Washington, D.C. Additional paratypes as follows: CALIFORNIA: *Siskiyou Co.*, Tate Creek, 8-IX-54, H. P. Chandler, 2♂ (SGJ) (CAS); *Trinity Co.*, Grizzly Meadows, 10-15-IX-64, Buxton and Gurney, 3♂ 1♀ (USNM); 10 mi W Thompson Peak, 16-IX-64, Buxton, 2♀ (USNM). OREGON: *Benton Co.*, Marys Peak, 3-VI-68, T. Yamamoto and S. D. Smith, 1♀ (ROM). *Curry Co.*, Fork Creek, 19-VII-67, E. Evans, 1♂ (USNM). *Harney Co.*, Fish Creek, Steens Mts., 20-VII-69, S. G. Jewett, Jr., 2♂ (USNM). *Lane Co.*, McKenzie Bridge, 21-IX-34, R. E. Dimick, 3♂ (INHS) (UU); McKenzie River, 21-IX-34, R. E. Dimick, 2♂ (OSU). *Lincoln Co.*, Tidewater, 6-VI-68, T. Yamamoto and S. D. Smith, 1♂ (ROM). *Linn Co.*, Marion Forks, 28-VIII-68, Goeden and Gurney, 1♀ (USNM). *Tillamook Co.*, Neskowin, 11-VII-63, G. Wiggins, 1♂ (ROM). *Yamhill Co.*, McMinnville, 4-V-47, K. M. Fender, 1♂ (CAS). WASHINGTON: Anderson Creek, Stevens Pass, 29-IX-59, 1♂ (INHS). *Chelan Co.*, Icicle Creek 9-X-71, L. Whyte, 1♂ (cWSC). *Clark Co.*, Lewis River, 15-IX-57, H. Hacker, 1♂ (USNM).

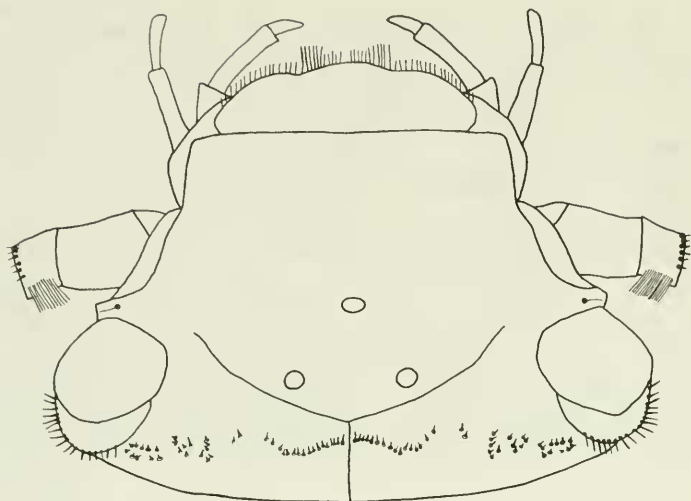
Additional specimens examined: CALIFORNIA: *Butte Co.*, Big Chico Creek, 26-XII-72, M. Kainu, nymphs (UU). *Fresno Co.*, South Fk. King River, 6-VII-10, E. C. Van Dyke, 1♂ (CAS). *Modoc Co.*, 20-VII-22, Lindsey, 1♂ (INHS). *Mono Co.*, Mono Lake, 31-VII-40, Lipovsky, 1♂ (KAN). *Tuolumne Co.*, Kennedy Creek, 18-VII-73, D. R. Givens and S. D. Smith, nymphs (cWSC). NEVADA: *Elko Co.*, near Midas, 20-IX-57, G. F. Edmunds and R. K. Allen, nymphs (UU); Franklin River, 19-IX-57, G. F. Edmunds and R. K. Allen, nymphs (UU). OREGON: *Benton Co.*, Philomath, 4-VII-63, G. Wiggins, 1♀ (ROM); Corvallis, 27-VII-62, G. C. Eickwort, 1♀ (MSU). *Hood River Co.*, Mt. Hood, 24-VI-25, E. C. Van Dyke, 1♂ (CAS). *Lane Co.*, McKenzie Bridge, 21-IX-34, R. E. Dimick, 1♂ 1♀ (INHS) (CAS); South Fk. McKenzie River, 4-IX-32, R. E. Dimick, 1♂ (INHS); McKenzie River, 21-IX-34, R. E. Dimick, 2♂ 2♀ (INHS). *Multnomah Co.*, Wahkeena Falls, 15-VII-63, G. Wiggins, 1♀ 2 nymphs (ROM). WASHINGTON: *King Co.*, Rex River 5-X-73, A. R. Gaufin, nymphs (UU). *Lewis Co.*, Nickle Creek, 1-IX-58, nymphs (UU). *Pierce Co.*, Slippery Creek, 5-IX-58, nymphs (UU). *Yakima Co.*, Chapparral Creek, 2-IX-54, B. Malkin, 1♂ (CAS).

This species is named for Dr. Richard W. Baumann of the Smithsonian Institution who has assisted in obtaining material and by making suggestions for this and other studies in progress.

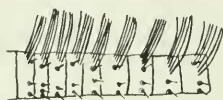
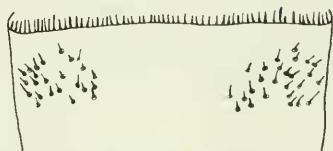
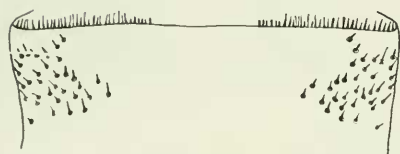
Doroneuria theodora (Needham and Claassen)

Acroneuria (*Doroneuria*) *theodora* Needham and Claassen (1922:254). Holotype ♀, allotype ♂; Yellowstone Nat'l Pk., Wyoming. (Cornell Univ. #1180). *Acroneuria theodora*: Frison (1942:284-285). In part. *Acroneuria* (*Calineuria*) *theodora*: Ricker (1954:39). *Doroneuria theodora*: Illies (1966:331). In part.

MALE.— Brachypterous to macropterous. Length of forewings 7-17 mm; length of body 19-22 mm. Similar to *D. baumannii* in



12



13

14

Figs. 12-14. *Calineuria* and *Doroneuria* nymphal structures: 12, *Doroneuria*, dorsum of head; 13, *Doroneuria* abdominal sternum 7 (mature ♂ nymph) and cercal segments basal and apical; 14, *Calineuria* abdominal sternum 7 (mature ♂ nymph) and cercal segments basal and apical.

coloration and general features. Aedeagus (Figs. 9, 10) without spines on the lateral sclerotized bars; ventral and lateral surfaces of aedeagus with numerous minute spinulae.

FEMALE.— Brachypterous to macropterous. Length of forewings 15-25 mm; length of body 29-31 mm. Subgenital plate and vagina similar to *D. baumanni*.

NYMPH.— Length of mature male 20-22 mm; mature female 31-34 mm. Presently indistinguishable from *D. baumanni*.

Doroneuria theodora is a species of the northern Rocky Mountains (Fig. 4). Records are presently from north of the Wind River range in Wyoming into southern Canada and west through Idaho to eastern Oregon. Published records of *theodora* from Utah and Colorado are based on the same species of *Acroneuria* nymph discussed under *Calineuria californica* above and should be disregarded.

Specimens examined in addition to the holotype and allotype: ALBERTA: Banff Nat'l Pk., above Bow Falls, 19-VII-69, C. M. Yarmoloy, 1 ♂ (USNM); Spray River, Banff Nat'l Pk., 15-VI-69, C. M. Yarmoloy, nymphs (UU); Crows Nest River, Crows Nest, 13-IX-73, R. Beck, nymphs (UU). IDAHO: Adams Co., Little Goose Creek, 21-VI-64, A. R. Gaufin, nymphs (UU). Bonneville Co., West Fk. Pine Creek, 21-VI-64, J. W. Richardson and S. L. Jensen, nymphs (UU). Boundary Co., Canyon Creek, 12-VIII-63, M. Brusven, 1 ♀ 4 nymphs (USNM). Idaho Co., Lochsa River, 19-VI-64, A. R. Gaufin, nymphs (UU). Kootenai Co., Beauty Bay Creek, 4-VII-64, A. R. Gaufin, nymphs (UU). Lemhi Co., Pine Creek, 28-VI-64, J. K. Adams, nymphs (UU). MONTANA: Gallatin Co., Hyalite Creek, 17-VIII-52, R. A. Hays, 1 ♂ (UU); Hyalite Creek, 16-VIII-52, R. A. Hays, 4 ♂ 1 ♀ (USNM). Granite Co., Ranch Creek, 23-VII-66, M. L. Miner, 1 ♂ (USNM). Ravalli Co., Burnt Fk. Bitterroot River, 16-VIII-65, J. R. Grierson, 2 ♂ 1 ♀ (USNM). OREGON: Wallowa Co., French Camp, Lostine Valley, 18-VIII-52, G. F. Edmunds, 1 ♀ 1 nymph (UU). WYOMING: Park Co., Beartooth Creek, 9-VIII-52, R. A. Hays, 1 ♂ (UU); Beartooth Creek, 31-VIII-51, R. A. Hays, 1 ♀ (UU); Beartooth Creek, 31-VIII-51, R. A. Hays, 5 ♂ (UU); Tower Creek, Yellowstone Nat'l Pk., 17-VIII-59, W. L. Peters and G. F. Edmunds, nymphs (UU). Sheridan Co., Tongue River, 20-VII-40, T. H. Frison, 1 ♂ (INHS); Tongue River, 28-VII-40, T. H. Frison, 1 ♂ (INHS); Big Horn Mts., 30-VII-40, T. H. Frison and T. H. Frison, Jr., 1 ♂ (INHS); South Fk. Camp, Big Horn Nat'l Forest, 4-VIII-52, B. Malkin, 1 ♂ (CAS).

ACKNOWLEDGMENTS

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